Memory

1) Theories of Remembering → (i) LOPA — (20) (Levels of Processing App.)
(ii) IPAA — (20) (Info. Processing App.)

2) Processes of remembering → (i) Encoding — (10)
(ii) Storage & retrieval — (10)

3) Meta Memory — (15/20)
(memory of memory)

4) Sensory Memory — (15)

5) Working Memory — (20)

6) Mnemonics — (10)

7) Amnesia — (15)

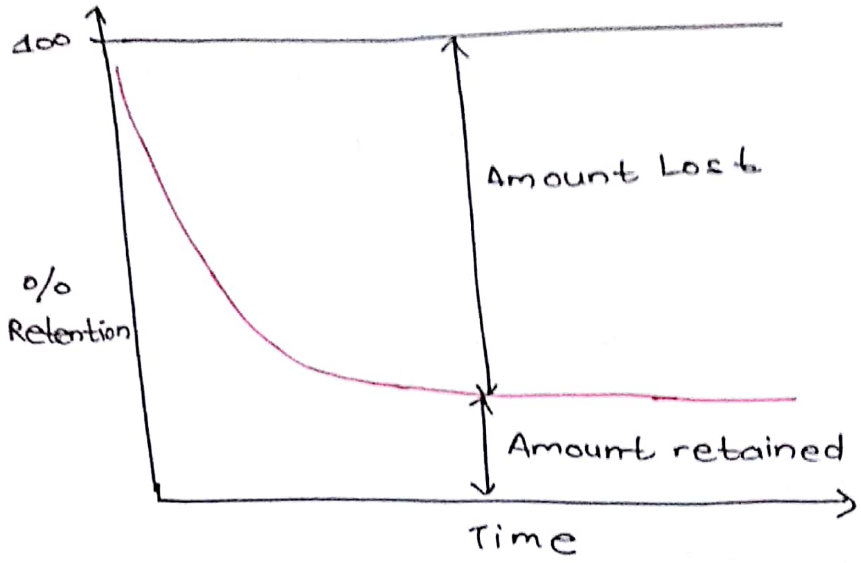
8) Forgetting → (i) factors — (10)
(ii) ~~Theory~~ Theories
↳ Interference — (15/20)
↳ Perseveration Consolidation Theory — (15/20)
↳ Decay Theory — (10)
↳ Encoding Specificity ~~*~~ Hypothesis — (10)
↳ State Dependent Learning — (10)
↳ Motivated forgetting — (15)

Forgetting → Partial or complete loss of previously learned information.

→ Loss of information that has been previously encoded & stored in Long Term Memory

* Hermann Ebbingham → classic curve of forgetting

SHOUT
SHARE
IT



Amount forgotten = Amount Learned − Amount Retained

⇒ Memory loss is never 100 % but if retrieval of that memory is not possible, it is lost.

* Term 'Forgetting' is used w.r.t. Long Term Memory

⇒ forgetting is max. immediately after completion of learning.

* Factors influencing forgetting

(i) Meaningfulness of TBRI (To be remembered information)

↳ with meaning there is higher prob. of it being associated with already stored info.

(ii) Distinctiveness

↳ (Von Restorff Effect)

↳ The more distinct it is, easier ~~is~~ it is to remember it.

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(iii) Length of TBRM / TBRI

↳ longer list takes more time to remember but once it is remembered, the retention is better. This is because the person develops association.

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* ~~Rote~~ Because remembrance of a short list is through rote learning, it will be easily forgotten.

* Word length effect ⟶ it is easier to remember a word in a sentence then ~~than~~ when the word is provided separately.

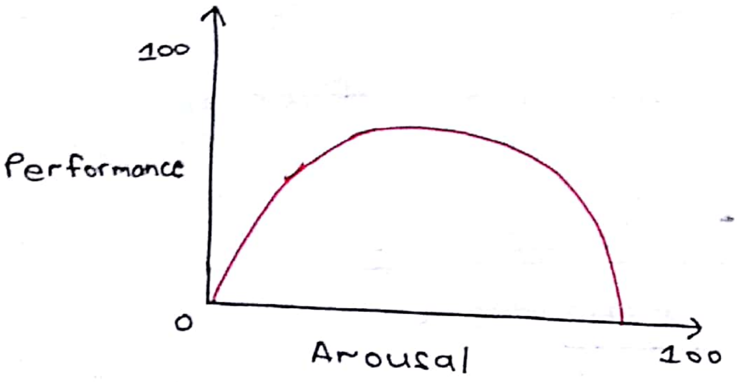
(iv) Personality factors

a) Gender ⟶ No gender difference

b) Age ⟶ decline in memory is observed in the 60s but it is more due to lack of practice.

⟶ Actual memory loss is seen in the 80s due to neuronal degeneration.

c) Motivation



[Yerkes - Dodson Law]

(Highest perf. at moderate level of arousal)

(v) Intelligence

↳ speed & complexity of information processing ~~with~~ ~~be~~ is intelligence. The better it is, the better the memory.

(vi) Organisation

↳ The better organised the input is, more resistant it would be to forgetting eg. poetry

(vii) Method of Learning

↳ part vs Hole

↳ spaced vs Massed

⇒ whole is more than ~~some~~ sum of its parts.

⇒ whole learning is better when:
- ↳ (i) moderate length
- (ii) Abstract material
- (iii) Subjects are intelligent

⇒ Part learning is useful when:
- (i) Material is long
- (ii) Can be easily divided into parts
- (iii) Some of the parts are of exceptional degree of difficulty.

* But even if learning is done by parts, synthesis needs to be done. Thus, first preference should be for whole learning.

* Spaced vs Massed

↳ single session → role of extraneous variables increases
↳ fatigue

(Spaced)
⇒ Learning trials should be interspersed with rest periods.

(viii) Feedback

↳ it will improve memory

↳ it has direct link to motivation → if you are doing well, motivation to do more

↳ feedback also enables a person to know the areas which need improvement → better strategy.

(ix) Over-Learning

↳ Learning that takes place after one or two perfect recalls.

↳ periodic revision is must because of this reason. ~~It~~ Learning follows Gaussian curve, but this is the best way to prevent forgetting.

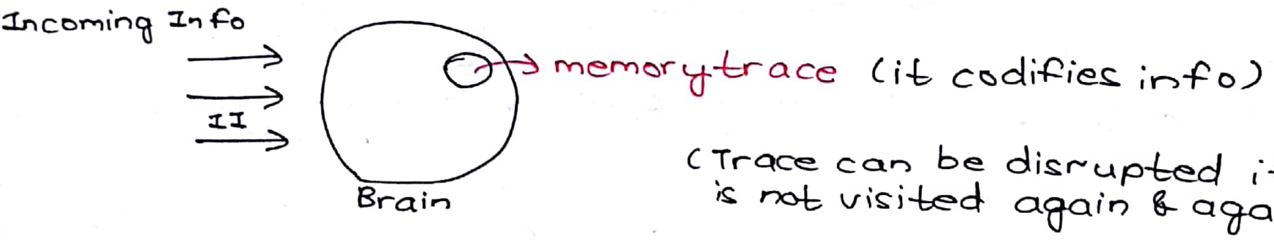
Theories of forgetting

(i) Trace dependent Theories → a) Perseveration Consolidation Theory. / b) Decay Theory
(ii) Cue dependent Theories
(iii) Gestalt Approach to forgetting
(iv) Biological Basis of Memory

(ii) Cue dependent Theories

→ a) Interference Theory
b) Motivated~~rs~~ forgetting
c) State Dependent Learning / Memory
d) Encoding specificity hypothesis

(i) Trace dependent Theories



(Trace can be disrupted if it is not visited again & again)

⇒ Forgetting happens when memory trace that was created during learning ~~wa~~ is not retrievable.

⇒ ~~When info~~. Memory trace is not available for recall.

⇒ forgetting is a function of retention failure.

(ii) Cue dependent Theories

↳ information is stored through cues

↳ retrieval cue → loss of retrieval cue & not the loss of information.

↳ Retrieval failure is a matter of accessibility,
Retention " " " " " availability.

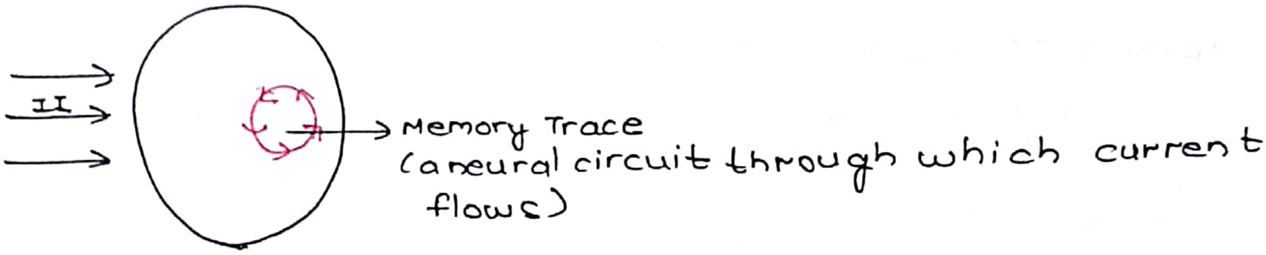
*Cue dependent forgetting.

Analogy
(You have lost the key but the closet is still there)

(i) Trace dependent Theory

a) Perseveration Consolidation Theory

↳ given by Müller & Pilzecker (drawn from the work of Hebb)



* When we do revision, we make current to flow in this neural circuit

* Perseveration → process of flowing of current in the neural circuil
↓
Outcome ~~Output~~ is consolidation

* Once ~~consitadi~~ consolidation is done, memory cannot be lost → memory can only be lost during perseveration phase (when it is volatile)

→ Completion of learning (understanding
→ " " consolidation
} Both are diff. Thus, understood info. can be forgotten

*Empirical evidence → Duncan

Rats → Learn ~~task~~ → ECS (Electro-~~conventiom~~ convulsive shock) → information lost.

convulsion:- massive movement of involuntary muscle.

Retrograde Amnesia :- information just prior to an accident is lost (due to the shock or trauma)

Q) Retrograde Amnesia follows temporal gradient.

Temporal gradient → more closer the event & accident, more likely it is to be lost as consolidation was not finished.
(Function of time)

*Limitations of the Theory

(i) Theory ignores retrieval failure

(ii) It cannot account, why do we forget things even after consolidation.

(iii) Period of consolidation

(iv) Similarity effect has not been accounted for.

*Similarity effect :- Nursery Rhyme + Chemical formula ⇒ I [Better retention]

Nursery Rhyme + Nursery Rhyme ⇒ II

- Similar things create confusion.

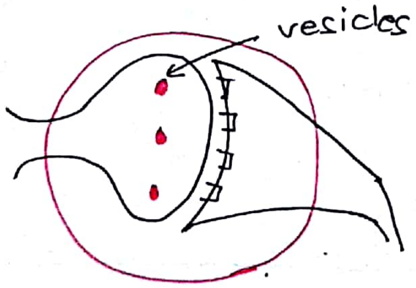
*Recent developments in Perseveration Consolidation Theory

Memory consolidation is the category of processes that stabilise the memory trace after its initial acquisition. Consolidation is distinguished into 2 specific processes.

(i) Synaptic consolidation

(ii) System's consolidation

Synapse



Post synaptic neuron will either facilitate flow of info. or block it.

Synapse

*Synaptic consolidation is synonymous with LTP (Long Term Potentiation) and occurs within few hours of learning. In system's consolidation, hippocampus (in mid brain) [Limbic System → emotion~~al~~ ~~&~~ centre of the brain]

* Damage to hippocampus will damage memory.

Hippocampus ~~based~~ memories become independent of it over a period of weeks to years. Synaptic consolidation is seen across all species in long term memory tasks. Long Term Potentiation (LTP) which is best understood form~~s~~ of ~~s~~ synaptic plasticity (shape of synapse changes due to ~~plastic~~ consolidation), is thought to be possible underline process in synaptic consolidation.

Synaptic consolidation $\xrightarrow{\text{then}}$ system's consolidation

* System's consolidation is a slow, dynamic reorganisation process in which memories are moved to neo cortex (cerebral cortex) ....①

- - - -

(old Brain → Limbic System)
[Emotions came to human beings before thinking that is why it is tough to control]

- - - -

① ~~In~~ in a more permanent form of storage

⇒ Recently a 3rd process has become a focus of research called as re-consolidation in which previously consolidated memories can be made labile (once again put into motion) again through reactivation of memory trace. Memory is retained in hippocampus upto 1 week after initial learning representing the hippocampus dependent stage. Thereafter, memory is slowly transferred to neo-cortex where they can be permanently stored. Hipp. can perform the task of storing memories temporarily because the synapses are able to change quickly whereas neo-cortical synapses change over time. Consolidation is is the process by which Hipp. activates Neo-cortex continually leading to strong connections bet. the two. Squire & Alvarez took the temporarily graded patients with retrograde amnesia as a support for the notion that once a connection has been established with the neo-cortex, the hipp. is no longer required.

(b) Decay Theory

(Hermann Ebbinghaus)

↳ Systematic Loss of memory traces over time leads to forgetting.

↳ The reason for this ~~are~~ is a metabolic process

(Disused Theory → if memory is not used, it is lost)

⇛ Jenkins & Dallenbach

↳ They challenged it and said that the loss in memory traces is due to the activities done ~~in~~ during the rest interval.

→ Similarity effect

(sleep after learning will have minimum interference)

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* New Disuse Theory

↳ Bjork & Bjork

↳ It proposes that there is a competition for retrieval among the items stored in LTM. Newly ~~learned~~ learned or recently retrieved items have an advantage over other items that are similar in fashion but have not been recently learned or retrieved. Compared with the former items, these latter items will be less accessible for retrieval.

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The new disuse theory has considerable practical value. One implication of this theory is that the information which is more recently learned will be more accessible to retrieval.

	Learn a thing 1	thing 2
Case I	100 times	10 times
Case II	10 hours back	1 hour back

In case I → Thing 1 better retrieved
" " II → Thing 2 " "

* More no. of revisions & as close to the exam as possible → for best memory

* Cue dependent Theories

* Encoding specificity Hypothesis (Endel Tulwing)

Memories are encoded in specific ways & at the time of decoding we must use the same language that we had used during time of encoding

Tulwing's exp.
(Phase I)

Subjects given paired-associate list of terms (TBRM) & WCW (weak clue words)

eg. if TBRM is'jacket
weak clue:- 'handle'
2) Board → $\overset{\text{clue}}{\text{Rose}}$
3) Beard → Bulb

⇒ Naturally associated clues were given.

* Subjects recall was worse when they were given naturally associated clues. The ~~in~~ perf. improved when they were given the weak clues.

* Memories are encoded with specific retrieval cues. Only those cues that are intially used will be utilised for retrieval.

Phase II

TBRM → A free-association test was given.

~~Leather~~ → A list was given & write 5 words that comes to mind through stimulus word.

Jacket

Board eg. Leather

Beard Black

Hair

⇒ Out of the 5 words generated → encircle if a word was part of TBRM

⇒ They wrote the word, but they could not recognise it.

⇒ Again, weak clue was given ⇒ ~~again retrieval happened and~~ they recognised the word.

* ~~Reco~~ ~~many~~ Some times, recognition is difficult than recall.

⇒ This shows the importance of encoding in both recall & recognition → Have full attention while encoding.

* State Dependent Learning/Memory

(SDL/SDM)

↳ Recall is best when state/condition in which information was learned is identical to state/condition in which it is retrieved.

eg. state includes → (i) physiological state
(ii) enviromental ″
(iii) mood ″

⇒Rats were made to learn a task under the influence of Amphetamine. They could recover it only in the drugged state.

context effect → environmental

⇒ If you go back into the same surroundings, recall is easy.

better learning with happy mood

* State of Happiness → (i) thinking is divergent
(ii) fatigue will be less
(iii) Encoding will be better
(iv) Brings anxiety level done

* Along with the info., physiological, env.& mood state are also encoded → that is why retrieval is easy in similar state.

Diff.
*mood :- less intensity, long duration
*emotion:- high " short "
*feeling → a mental state ; emotion will have physiological component in it.
*Affect → combination of emotion & mood

*Our memories can be influenced by our moods in both +ve & -ve manner.

→'Mood congruent effect' states that the info. that is in congruence with the prevailing mood can be recovered easily. This processing occurs when material is selectively encoded or retrieved. Thus, individual in happy mood will encode or retrieve more info. if the material is affectively +ve than if it is depressing or effectively -ve.

* Mood dependent memory accounts for encoding retrieval relationship suggesting that there is an increased likelihood of retrieving info. in a particular mood state.

Mood works as one of the contexual factor that gets encoded with the info. At the time of info recall, if this context is available i.e. person is in the same mood as he was when he acquired info., the recall is the best.

Attentional Theory

Ellis etal have proposed resource allocation and cognitive interference theory. The basic assumption is that when the individual is preoccupied with his mood state, the attentional resources for the memory task available become limited leading to impaired memory. Therefore, extreme moods must be avoided.

⇒ Yerkes & Dodson have given cognitive narrowing as an explaination for poor perf. in heightened arousal conditions.

* Motivated Forgetting Theory

(Freud)

↳ forgetting is rooted in the motive of displeasure (In the book Psychopathology of Every-day life by Freud)

→ There is selectivity involved in remembering as well as forgetting.

→ unpleasant memories are forgotten

→ unpleasant → anxiety provoking memories

⇒ Anxiety is provoked due to 'sex' & 'aggresive' impulses.

⇒ Freud hinted at his defence mechanism of repression. This is a retrieval failure.

*Parapraxes → slip of pen ~~&~~, tongue, etc.

* As testing of this theory in lab conditions will involve giving huge anxiety → not ethical

*Evidence to the theory

(i) Hypnosis

(ii) Zeigarnik's theory
(incomplete tasks are better remembered)
↳ It supports as if tension is cause for ~~tension~~ [illegible] rememberi
it can also lead to forgetting.

In an Exp.

→ condition was laid incompleteness leads to incompetenc
Zeigarnik's effect reversed.

→ How much a particular thing will embarass me?
↳ (This question is asked → embarassment is a much stronger force than curiosity.

⇒ Subjects forgot the (works) parts that were incomplete & only remembered the parts (works) that were complete

⇒ Thus, remembering or forgetting will be done on the basis of the desire (or tension) → which tension it is?

Zeller's Experiment

* Experimental Group → task A ~~&~~ $\xrightarrow[\text{Rest Int}]{\text{task B}}$ Recall Task A [Egodeflation was done ~~after~~ during task B ~~task A~~

* Control Group → task A $\xrightarrow[\text{Rest Int}]{\text{taskB}}$ Recall Task A

⇒ Perf. of control group was much better while recalling task A while the group that received egodeflation (humiliation)

⇒ Transfer of -ve effect ~~transfe~~ happened to task A also [Though egodeflation was done on task B]

* Humiliation was not done during task A as that would have introduced extraneous variable (learning would not be equal in both the groups)

Further, they were given additional training of task B to both groups.

This time exp. group were given egoinflation. This time when perf. was measured on Task A.

↳ This time some performed even better than the control group.

Egodeflation $\xrightarrow{\text{led to}}$ Repression

Egoinflation removed the repression

Limitation

(i) Theory only speaks about retrieval failure & not retention failure.

(ii) It only considers subconscious

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* Interference Theory

It is the most popular & best documented theory of forgetting. It focuses upon the interaction among diff. items of previously learned info. Failure to ~~recall~~ recall a particular item of info. is attributed to the influence of other, usually similar items of stored info.

The items of information that one has to recall are called as originally learned items and the items of information that we have learned prior to the originally learnt items are called as prior learning.

The learning that takes place during the rest interval after the original learning is called as the interpolated learning. When prior learning interferes with original learning, it is pro-active interference whereas when the interpolated learning interferes with original learning, it is retro-active interferen

I) Exptal. grp:- (ABB) Learn German + Learn French → Recall French

Control grp:- Learn French → Recall French

Performance is compared.

⇒ Proactive interference:- If exp. groups perf. is poor as compared to control grp.

" facilitation:- If reverse

II) Expt. grp:- (ABA) Learn french $\xrightarrow[\text{Rest interval}]{\text{Learn German}}$ Recall french

Control grp:- Learn french → Recall french

In Case II, if exp. grp perf. poor as compared to control grp. → Retroactive interference

If reverse → Retroactive facilitation

ABB → Proactive

ABA ~~ABBA~~ → Retroactive

(i) prior learning (before original learning)

(ii) original " (learning which has to be recalled)

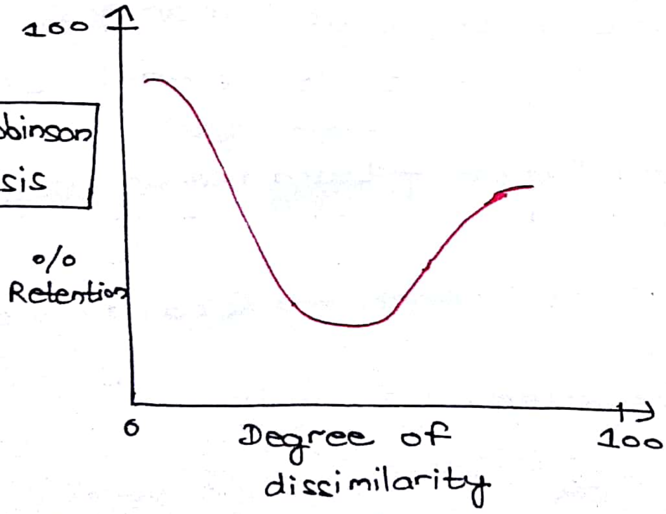
(iii) interpolated " (after original learning)

Prior learning & Interpolated learning can be facilitatory or interfering (inhibitory)

* facilitatory → remembering

* interfering → forgetting

Skagg-Robinson Hypothesis



Inference : (i) Max. confusion is when items of information are moderately similar.

(ii) Best retention is when items are identical or highly similar

(iii) There occurs similarity pardox (self-contradictio)

⇒ As we move from moderately similar to highly dissimilar, perf. increases but it never reaches the level of high similarity items.

Reason:- When there is high similarity → +ve transfer
moderate 〃 → -ve 〃
high dissimilarity → 0 transfer

* McGeoch :- Independent Hypothesis → To explain interference

Subjects	List I	List II
	(paired associatelist)	(paired associate) [stimulus term was same but response term was diff.]
	eg. Akbar - Birbal Jehangir - ShahJahan	eg. Akbar - JodhaBai Jehangir - NurJahan

After same no. of practice sessions, when Akbar is given and asker to recall item of List I, competitio bet. Birbal & JodhaBai → Interlist Intrusions (no. of times word from list II was given by the subjects)

→ Response Competition

*We designed a paradigm with stimulus item & response item which were paired associate list. Response item was different in the 2 lists.

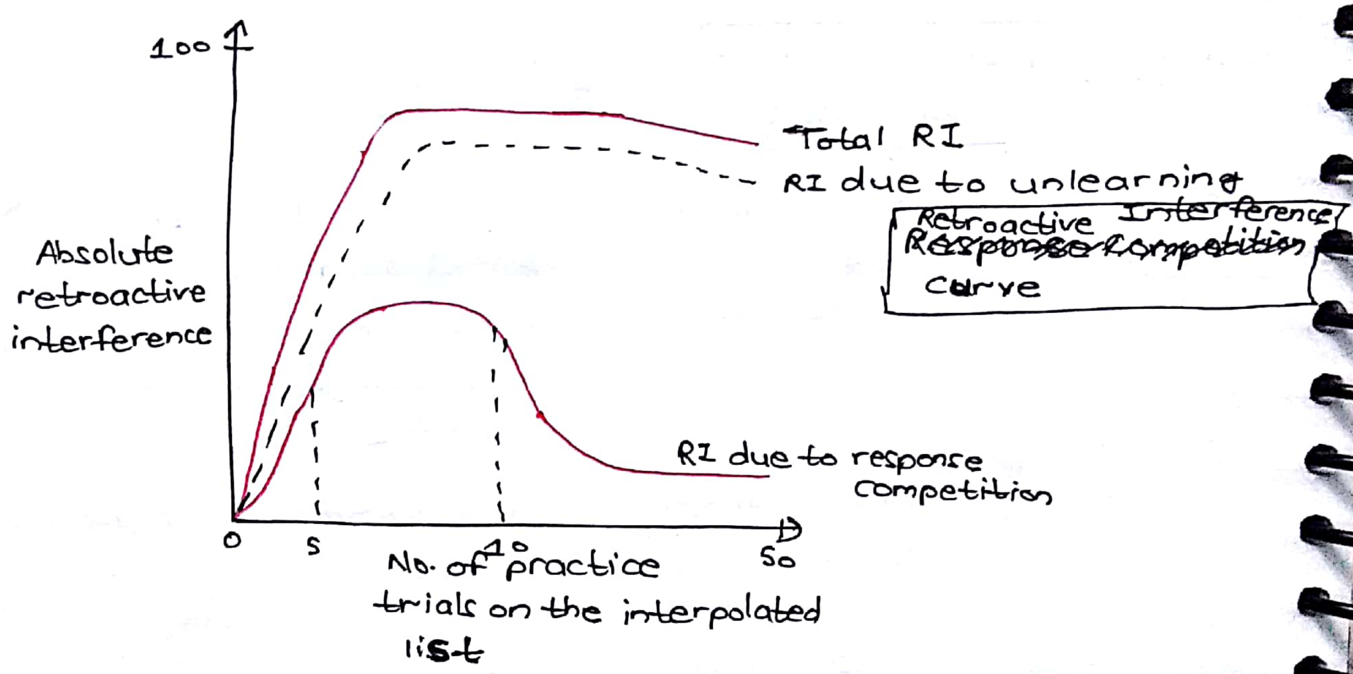
* Case II :- List I practice 20 times & List II 100 times.

⇒ With more practice with list II, subject will remembe that item from list II is not the answer.

* Melton & Irwin → Two factor Theory
↳ Response competition
↳ Unlearning

→ As the no. of practice trials on interpolated list. increase, response competition decreases (though forgetting overall is increasing) ⟶ This is due to the factor of Unlearning (initial phase)

*Max. forgetting is when unlearning has started (both unlearning & response competition will be high at this phase)



Q1) Is Unlearning present in every learning?

~~Ans~~

Q2) Is it necessary for us to forget before we learn?

Ans:-
⇒1) In every learning, unlearning will not occur but in some case unlearning will occur.

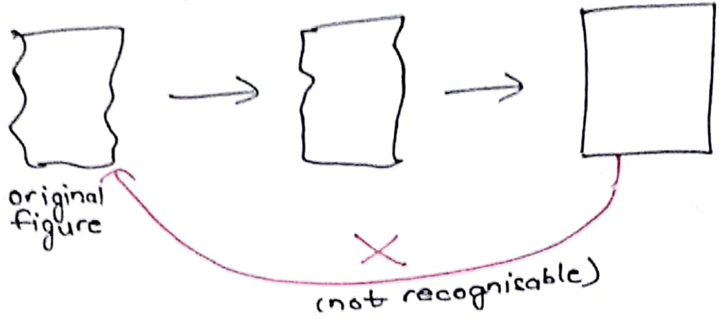
Ans:-
2) If prior learning strengthens original learning then no need to unlearn.

* Gestalt Theory

⇒ They have approached memory from the side of perception.

⇒ Good figure (Pragnanz)

⇒ forgetting does not occur, the figure gets transformed to new figure, no longer identifiable with original figur.



Q) The figure that is reproduced is better than the figure that was seen. Elaborate.

⇒ What I reproduce is a good figure. After ~~excess~~ many reproductions, the final figure will be ~~are~~ the best figure. (RSS → Regularity, Similarity & Symmetry)

* Biological Basis of forgetting

→ Certain neurotransmitters are involved in forgetting
eg. norepinephrine

→ Today, in lower level brains, there is some evidence of a neural circuit.

→ Frontal Lobe (~~Ca~~ Cerebral cortex) & Hippocampus involved in memory → evidence comes from Consolidation theory

→ Middle brain → Short Term Memory
Frontal Lobe → Long " "

⇒ Earlier it was believed that RNA was involved in memory. But this has been rejected. Now, it is believed that there are structural changes in neurons while learning and remembering.

* McConnell's flatworm experiment & Transfer Experiments (RNA was transferred)

Remembering

(i) Encoding
(ii) Storage
(iii) Retrieval

(i) Encoding

It is the process of receiving the sensory input & transforming it into a code in order to facilitate its storage. It can also be defined as the formation of internal memory representation of a stimulus. Never ever the stimulus is encoded as it is, the more complex is the stimulus, the greater is the likelihood of it being transformed during encoding. The mental representation that is formed during encoding is called as the memory code or the engram and its characteristics are determined by the particular type of coding used by the subject. Engram is memory representation & this representation is not the literal copy of the stimulus. This implies that only certain features of the stimuli are represented mentally. Tulwing's encoding specificity principle says, "what is encoded determines what information is stored in the memory and what is stored in the memory determines what retrieval cues will be effective in retrieving that information." For ex. if the word 'stimulus' is to be remembered than the important attributes of this term such as the semantic aspects, phonetic aspects, etc. may ~~be used~~ serve as retrieval cues. Acc. to Tulwing for effective performance, the memory representation est. at the time of learning is the one that is called for by the cues at the time of retrieval

The encoding process therefore involves the transformation of the information into the form that can be retained & when the person intentionally tries to encoded the info. , it is called as "explicit encoding" and when the person encodes the info without conscious intent, it is called as incidental learning. Acc. to G Bower, there are 4 types of stimulus encoding:

(i) Stimulus selection
(ii) Stimulus elaboration
(iii) Re-writing
(iv) Componential Description

(i) Stimulus selection

↳ select a few specific and ~~recogni~~ unique stimulus (stand out features) ~~& etc~~

(ii) Stimulus elaboration

↳ giving meaning ~~of~~ to the stimulus

(iii) Re-writing

↳ eg. CLEMPOX was to be remember, it was re-written as COMPLEX

↳ re-writing to addmeaning.

(iv) Componential Description

↳ look for phonetics, semantics, etc. to ~~fixed~~ add some meaning

↳ Description will be more when familiarity is less.

* Factors influencing encoding

(i) Warm up

Encoding can be facilitated through warm up procedures that allow the subjects to become familiar with type of material to be learned. Learning can be made easier by providing the people the outlines or the overview of the material to be learned. This allows the subjects to organise & place in context the material that is being learned.

(ii) Knowledge-base

Greater is the knowledge base of the subject regarding the topic, easier it is for the subject to encode the info. Wider knowledge base allows the subjects to establish more stable & effective associations between TBRM & the material or the items already stored in our LTM.

(iii) Spacing effect

It is always beneficial to spread the practice over many sessions than to mass the practice in one or two long sessions.

(iv) Personal Relevance

Greater is the individuals ability to accord personal meaning to the event being encoded, the more elaborate is the encoding.

(v) Overlearning

It enables the learner to get easy access to the stored material & retrieve it in quick time. It also facilitates encoding because going over the info. again & again ensures that the TBRM is given the shape that allows it to fit into individual's LTM.

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(vi) Meaningfulness of the material

↳ more meaningful, more easily encoded

(vii) Pattern of material

↳ It implies material which is distinct can easily be encoded (Von Restorff Effect)

(viii) Organisation

↳ Inputs can be put in a particular category.

↳ organisation ensures least effort during recall and encoding.

↳ It also facilitates storage & body's evolutionary goal of least effort can be realised.

Subjective organisation :- organisation done by the subject (not general)

It is the process of grouping discrete individual items into units based on specific relationship among the items. Organising the material to be learned is an excellent way to enhance encoding effectiveness. It is a process by which individual items are grouped together on the basis of some shared relationship. This relationship can be virtually anything i.e. meaningful or distinctive to the person.

Items therefore can be organised on the basis of their size, shape, color, hardness, etc. The process of chunking is one of the methods that enables us to organise the material into meaningful units. Chunking enhances encoding by reducing the amount of material that needs to be processed & stored.

Types of organisation

(i) **Primary organisation**

It is based on physical, temporal or spatial characteristics of TBRM

(ii) **Secondary Organisation**

↳ based on semantic characteristics of the stimuli.

(iii) **Subjective organisation**

↳ provided by the learner personally when there is no organisation inherent in the input.

Exp. by Bousfield → clustering

Bousfield carried out an exp. that demonstrated that subjects tend to organise info. in memory. In his exp., subjects were randomly presented with the 60 item word list consisting of 15 animal names, 15 vegetable names, 15 names of ~~Bod~~ boys & 15 names of professions.

⇒ During the recall it was found that subjects tended to organise items on the basis of category membership. This tendency is called as clustering and it demonstrates organisational structure of memory attributable to the conceptual relationship among the words in the list.

Tulving has shown that people try to impose structure of organisation on a list of words even when the words are unrelated to each other. This subject imposed organisation becomes evident when over series of trials, subjects develop consistency in the order in which they recall the items. Tulving referred to this as subjective organisation. Findings such as clustering & subjective organisation indicate that subjects tend to organise the items of information even when they are not instructed to do so.

* Factors that inhibit encoding

(i) Information Overload

(ii) Incomplete sensory processes

~~(iii)~~ ↳ if input is below or at threshold, encoding will never be complete.

(iii) Lapses in attention or the lack of attention

(iv) Personal motivation

↳ not motivated to remeber

Storage

It is the process of putting the coded info. into memory. The multi store model of memory identifies 3 memory stores —

(i) Sensory Memory Store

(ii) Short Term Memory Store

(iii) Long " " "

Retrieval

It is the process of getting access to the stored info. When target info. is successfully reproduced, 2 possibilities may be distinguished:

(i) Encoding specificity principle which asserts that reproduction is ~~pos~~ successful if the cue matches with the stored info.

* **Generation Recognition Hypothesis** → eg. if key is lost, use diff. master keys to find out the correct key.

* Generation recognition Hyp. asserts that for the reproduction to be successful, one does not necessarily need the cue that matches with the original info. stored in our memory system. Rather, we require that the cue needs to be related to the info. in some way. Acc. to Gen. Recog. Hyp., 2 ~~stages~~ stages of retrieval can be distinguished.

The I stage is of info. generation in which info. in our memory system is activated. The II stage is one that of recognition in which it is assessed that whether the segments of activated info. ~~to~~ do infact comprise of the target info.

The **2 retrieval possibilities** discussed in the generation recog. hyp. were once considered to be exclusive but recent studies have shown that retrieval at times can proceed along both routes.

* 2 retrieval possibilities
- → (direct retrieval) encoding specificity
- → generation recog. hyp. (indirect retrieval)

Now, it is found that both can occur simultaneously

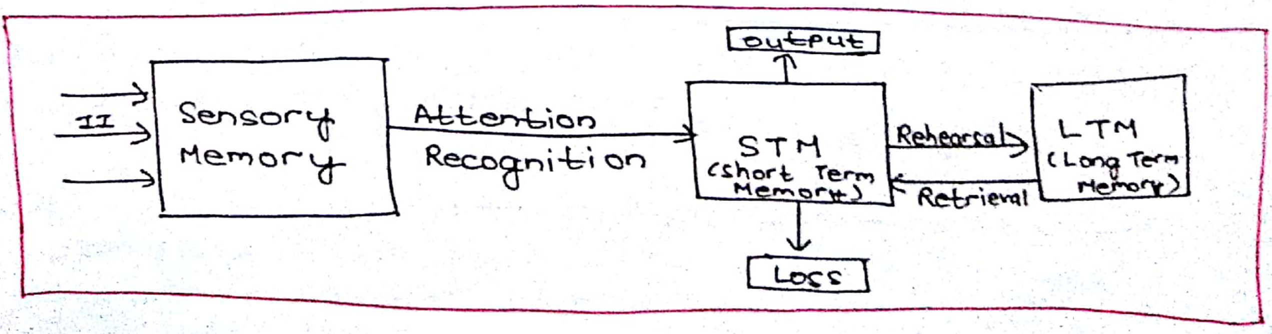
Factors influencing retrieval

(i) State dependent learning & context effect.
(ii) Mood dependent memories
(iii) Retrieval cues
↳ more unique, highlighted they are, better retrieval
(iv) Elaborative Rehearsal
(v) Schema
↳ They are the packets of info. in our LTM. They are the memory representation of people, objects, situations & events acquired from our environment & encoded in our memory. Schema influence both what is encoded & what is retrieved. They establish expectations that result in the selection of the feature or the features of events coded in our memory. Schema constructively guides the encoding of events through the process of interpretatio & integration. They reconstructively guide the retrieval processes by helping us fabricat how the events must have originally happened

* Information Processing Approach

↳ by Newell Shaw & Simon
↳ Applied to memory by Atkins & Shifferin → Multi store model or Dual Mod
(Serial Processing Model)

Input → processing → output


II
Sensory Memory
Attention
Recognition
output
STM (short Term Memory)
Loss
Rehearsal
Retrieval
LTM (Long Term Memory)

1) Structural units → STM, LTM & SM

2) Control Processes → Attention, Recognition, Rehearsal & Retrieval.

*Characteristics of ~~SM~~ Sensory Memory

Physical Energy → Sensory receptors
↓
Storage function
↓
(sensory register) Sensory memory store

* Sensory Memory Store:
  - (i) Visual → Iconic Memory Store
  - (ii) Auditory → Echoic Memory Store
  - (iii) Tactual → Haptic
  - (iv) Olfactory
  - (v) Kinesthetic

* In sensory memory → exact replica of input.
* brief period of time → upto 1 sec for visual & 4-5 sec for auditory

⇒ Memory lost from SM → Through Decay

⇒ if attended to & recognised → goes to STM

* Characteristics of Short Term Memory

STM → 7 ± 2 items
(5 to 9)

(Amount of material stored in each item can be ~~reduced~~ increased through chunking

(550) ㊶ ㊷ → 3 items after chunking.

⇒ STM → rehearsal → LTM

⇒ rehearsal :- keeping the items at the centre of attention by going over them either silently or aloud.

Acc. to Atkins & Shifferin, STM →
- a) single store (1 component) (unitary)
- b) Passive ~~store~~ role
- c) has preference for phonetic coding

⇒ Items are lost from STM through the process of displacement

⇒ Max. duration → 30 sec (generally 15–20 sec)

* Glanzer & Cunitz ⟶ Serial Position Effect

→ Position of item in the list matters when it comes to recall

→ Items in the middle of the list → tough to recall

A B C D | E F G H | I J K

(primacy) (recency)

Reason for this

*Primacy → gone to LTM

* Recency → still in STM

04-Jan-2019

*Exhaustive Scanning → It implies when the material is brought from LTM to STM, we look for the items we specifically need.

↳ we do not stop when we find the item we need but scan all the items that have come to STM.

Long Term Memory

(i) Infinite

(ii) Unlimited period

(iii) Info reaches LTM post rehearsal in STM

(iv) Encoding, storage & retrieval are carried out in LTM.

Tulving → two types of LTM ⟶ (i) Semantic
(ii) Episodic

*Semantic → Network of meaningfully organised info.
↳ knowledge about what the words mean, how they are interrelated & rules for using them in comm. & thinking.

→ kind of mental dictionary

→ it consists of our General knowledge, knowledge of grammatical rules

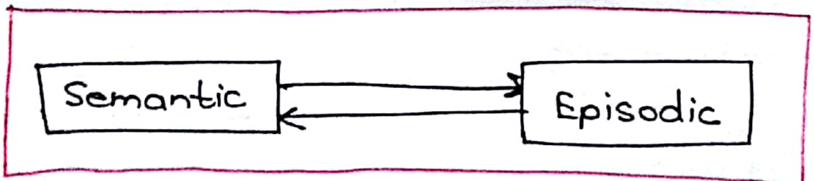
→ it is very well organised & is generally resistant to forgetting.

*Episodic → Our remembrances of specific things that have happened to us at particular time & places.

→ They are organised w.r.t. spatio-temporal context

→ Since Episodes do not have any systematic & organised occurence, therefore, episodic memories are not useful in drawing of logical inferences

→ more susceptible to forgetting



(episodic can become semantic & vice versa)

* when we give meaning to an episode → episodic to semantic

* when we use our knowledge in life's happenings → semantic to episodic

*(Procedural memories least affected in Amnesia) →first episodic then semantic

* Models of Semantic Memory

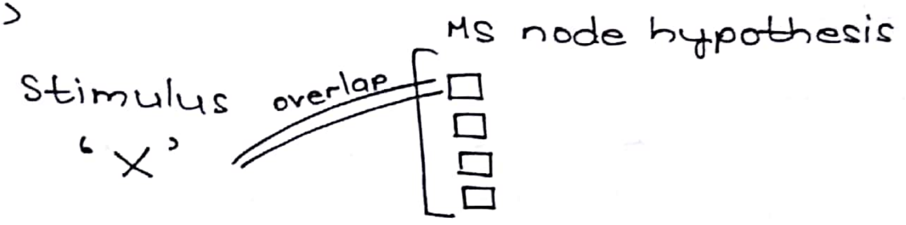
(i) Feature comparision model ——→ a) Defining
b) characteristics

(ii) Network Model

(iii) Spread of activation of node hypothesis

→ (given Smith, Shoben & Rips)

(i)


MS node hypothesis
Stimulus
'X'
overlap

feature comparison model

(when overlap is moderate ⟶ most ~~of~~ confusion
↓
In this case we check not just characteristic features but also defining features.

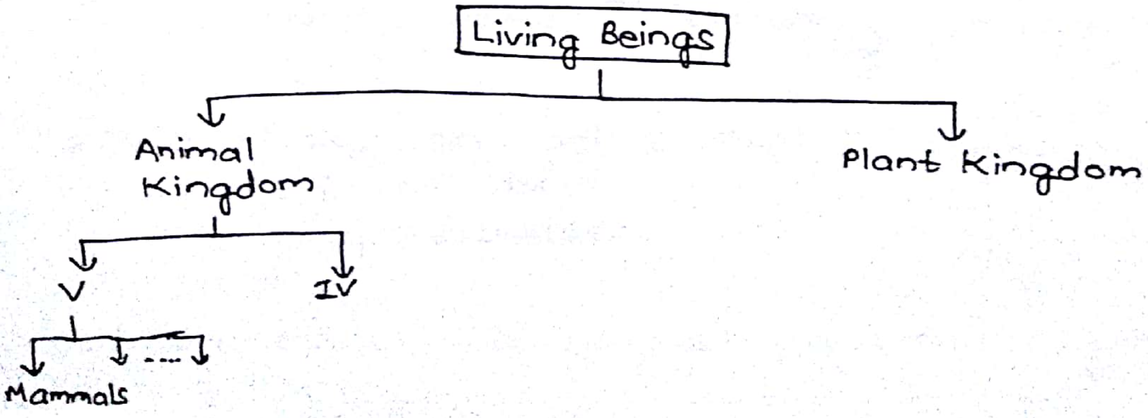
Characteristic ⟶ features shown by ~~some~~ most of the members of that category

Defining ⟶ features shown by all members of that category

Limitations ⟶ (i) what if no defining ~~category~~ feature is present
(ii) This much time is not usually ~~no~~ available in real time (to check overlap & features)

(ii) Network Model

(given by Collins & Quillian)

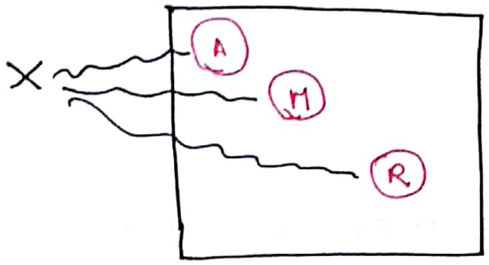

Living Beings
Animal Kingdom
Plant Kingdom
V
IV
....
Mammals

⇒ We move across these levels (no previous level is repeated)

⇒ In a hierarchial manner things are laid in our memory.

→ This is also time taking process

(iii) Spread of activation of node hypothesis
↳(Collins & Loftus)



All nodes get activated simultaneously & then it is decided to which category the object belongs to.

⇒ Least time taken here

* Encoding & storage in LTM

(i) Organisation
(ii) Role of imagery
(iii) Constructive Processes ⟶ (a) Levelling
(b) Sharpening
(c) Normalisation

(i) Better organisation, better storage & encoding.

(ii) Imagery should better be present at both stimulus & response level, if only one than it is better to have imagery at stimulus level.

Images are partial & altered representation of events occuring around us.

(iii) constructive process → The changes that are made at the time of encoding.

a) levelling :- removing few details which are disturbing

b) Sharpening → elaborating some features which are interesting.

c) Normalisation → presented as they are; in a conventional manner

(Same things will be part of Reconstructive Process)

* Retrieval

(i) Retrieval cues
(ii) SDL & context effect
(iii) Re-constructive Processes

(i) Retrieval cues → reminders that direct our search to appropriate part of LTM store

→ more distinct, more highlighter or better organised info → easier to retrieve.

→ it will either be present in the input or subject has to provide himself (similar to subjective organisation

(ii) SDL & context effect

↳ when context is present, additional retrieval cues are available.

(iii) Re-constructive Processes

↳ changes being made in the stored item.

↳ includes levelling, sharpening & normalisation.

(For them unconscious means → retrieval cues not available or blocked in conscious state)

* Evidence in favour of 2 chambers → STM & LTM

(i) Neurophysiological Evidence

(given by Brenda Milner); patient HM; Henry Gustav Molaison)

→ He had epilepsy

→ Lesions appeared in Temporal lobe → operated

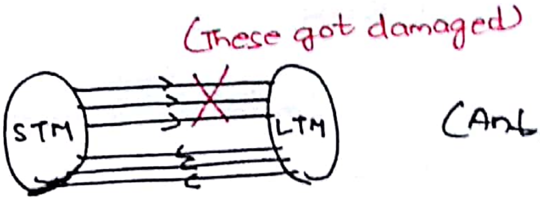
→ After operation → He used to laugh on the same joke no matter how many times he read it.

→ They measured LTM → it was found to be normal

→ They " STM → it was also normal

→ " " Intelligence → normal

Later it was found that during the surgery, hippocampal fibres were damaged.



(Anterograde Amnesia)

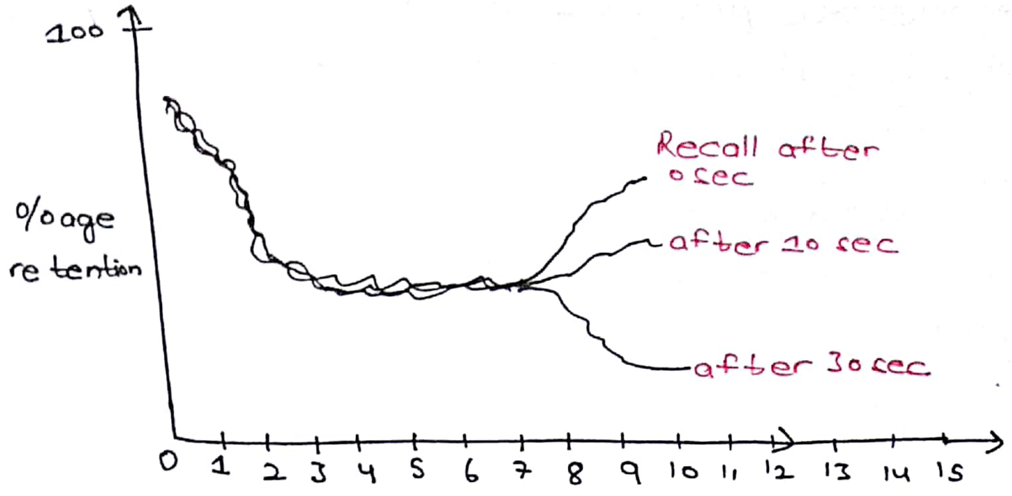
Thus, movement of info. from STM to LTM was disrupted. No new info. was going to LTM.

Retrograde Amnesia :- (Duncan) Rate → shock → lost memory of events before shock.

* II evidence

Primacy → LTM

Recency → STM



Serial position of the item in the list of items presented to the subject

⇒ After 30 sec no scope of recency.

⇒ Application of this → attention is min. during the middle of lecture.

* III Evidence

⇒ Differential coding

- STM has preference for phonetic code
- LTM " " " semantic code

Phonetically moderate similar list	Unrelated List I	Semantically moderate similar List	Unrelated List II
can	Tubelight	Huge	Radio
ban	coat	Big	wall
tan	market	Large	pitch
san	chair	Mammoth	Black
pan			

To group I

⇒ These 4 lists were provided and their delayed recall was taken.

⇒ To group II → immediate recall was taken

⇒ For immediate recall → $\boxed{8\% \quad 82\% \quad 83\% \quad 84\%}$ (Recall %age)

(Skagg- Robinson Hypothesis) → phonetically & moderately similar → most confusion is STM

⇒ For LTM, moderate phonetic similarity will not cause any confusion, it is neutral for it

For Delayed Recall

⇒ For LTM, moderate semantic similarity will have least %age recall as it has preference to semantic encoding (all other are neutral for it).

5-Jan-2019

*Limitations of Info. Processing Approach

(i) Oversimplified model

(ii) Account of STM inadequate → said to be passive store but rehearsal shows that it is active

→ said to be one componential but present understanding shows it to be multi-component.

↓

Working Memory

(iii) LTM → single store ⟶ Tulving LTM → semantic

↳ episodic

(But now, procedural memory also present (motor action memory)

(iv) Serial Processing ⟶ but we know now that Parallel Distribution Processing (PDP) also involved

Procedural memories consist of learning that has been obtained incrementally & not available to conscious recollection

↳ Practice is required

Levels of Processing Approach

↳ given by Craik & Lochhart

→ Incoming info. is worked (processed) at diff. levels of analysis & the deeper is the analysis, the better is the memory.

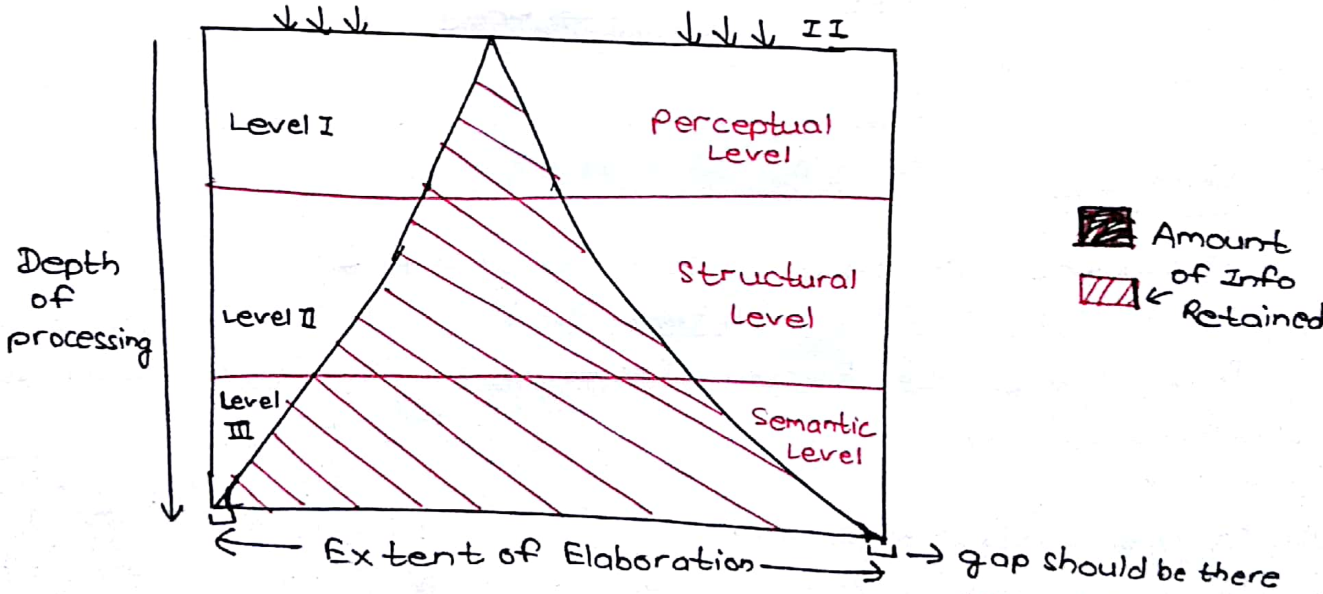
→ LOPA abandons the discrete storage systems that happened to be the feature of IPA & infact focuses upon diff. levels of retention.

Single Memory Store → II is processed at diff. levels

2 assumptions

(i) Memory trace is the by-product of comprehension & perception.

(ii) Retention is directly related to levels of processing.


II
Level I
Perceptual Level
Depth of processing
Level II
Structural Level
Level III
Semantic Level
Extent of Elaboration
Amount of Info Retained

→ gap should be there (100 % elaboration not possible)

(i) Perceptual level → ~~nearly~~ the awareness of stimuli

(ii) Structural " → awareness of structural features of the stimuli

(iii) Semantic " → meaning of input is analysed.

→Once info. reaches semantic level, it cannot be forgotten (almost 100 % elaboration)

⇒ Semantic level is only possible with elaborate rehearsal. In elaborative rehearsal, meaning is given → active method of rehearsal (diff. from maintenance rehearsal which is passive)

- Empirical evidence in favour of this model

I

(i) Slamecka & Graf

↳ Generation effect

Group I (Generate Rhyming associate)

* Stimulus word → House ** → Mouse
→ Spouse ⇒ → Blouse
→ Can → Ban
→ Tree → free

Group II

Read the list generalised by group I

Then, surprise Recall Test ⇒ Group I performed better

* To generate the word, info. is processed at a deeper level. This is known as generation effect. (Gist of info. ~~make~~ made by ourselves is better remembered)

* Evidence II

(given by Rogers, Kirker & Küiper) → Self reference effect

*List of 40 adjectives was given to the subjects & they had to make a judgement of these 40 words on the basis of their meaning, acoustic & physical properties, etc.

⇒ Of these 40 adjectives, ~~the ones~~ Some of them applied to them

⇒ In a surprise recall test, the adjectives that were applicable to them → their recall was best.

⇒ Adj. that applied to them were processed at a deeper level.

⇒ This phenomenon also applies to significant others.
(→ Self or Familiar Person Reference Effect (term coined by Matlin)

⇒ interrelated traits are also processed deeply eg. with polite → humble, courteous, etc. will also be processed.

Q) Why is info. better recalled when it is deeply processed?
Ans:(i) Distinctiveness → The info. will become more distinct when it goes to deeper level.

(ii) Other reason is that meaning is attached to the info., through elaborative rehearsal.

⇒ Taking every info to semantic level will lead to wastage of energy.

⇒ In this model, it is continuum and not 3 diff. blocks.

Limitations

(i) Why is info lost or is not recovered after it has been processed at deepest level?
⇒ No answer for this

(ii) Levels of processing required for diff. tasks
(no info. was given about this)

(iii) Deeper level processing is always better than shallow level processing → Not Always True

Mnemonics

Q) What are the ways to ensure better remembering & prevent forgetting?

Ans=
(i) Spaced Practice
(ii) Transfer Appropriate Processing
(iii) Teach it to others
(iv) Add personal relevance to the info.
(v) Funnel Approach → move from general to specific
(vi) Active involvement of the learner
(vii) Making vivid associations
(viii) Use of visual imagery
(ix) Read the TBRM aloud
(x) Minimise Interferences

------

*Mnemonics

→ Method of remembering info. that is otherwise difficult to recall.

→ Specific aids to facilitate recall

→ mental shortcuts

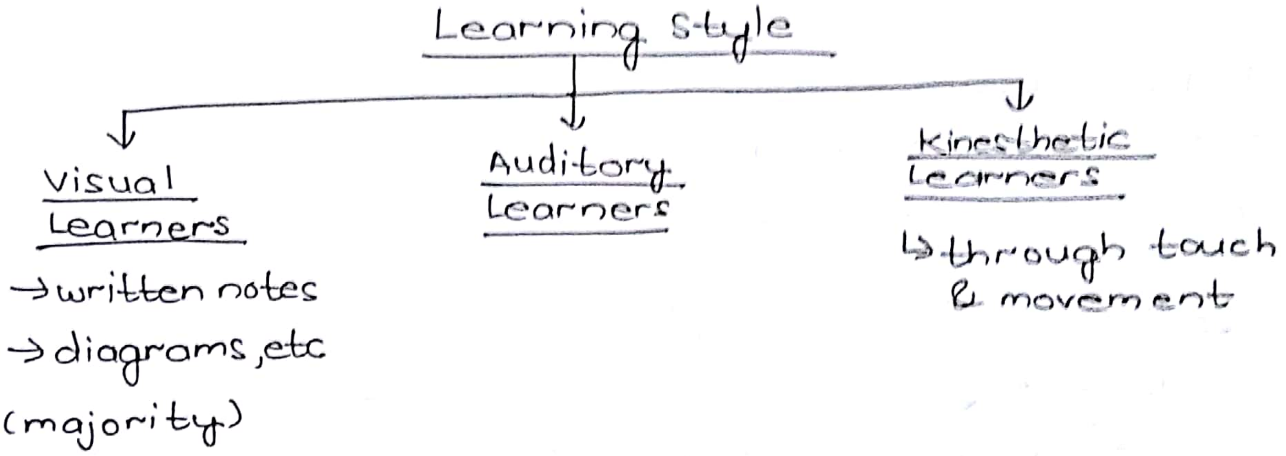
→ Internal strategies to facilitate better encoding storage & recall of TBRM.

→ To use as many functions of human brain as possible to store info.

3 principles

(a) Association
(b) Location
(c) Imagination

⇒ use of mnemonics depend upon the learning style of the learner.

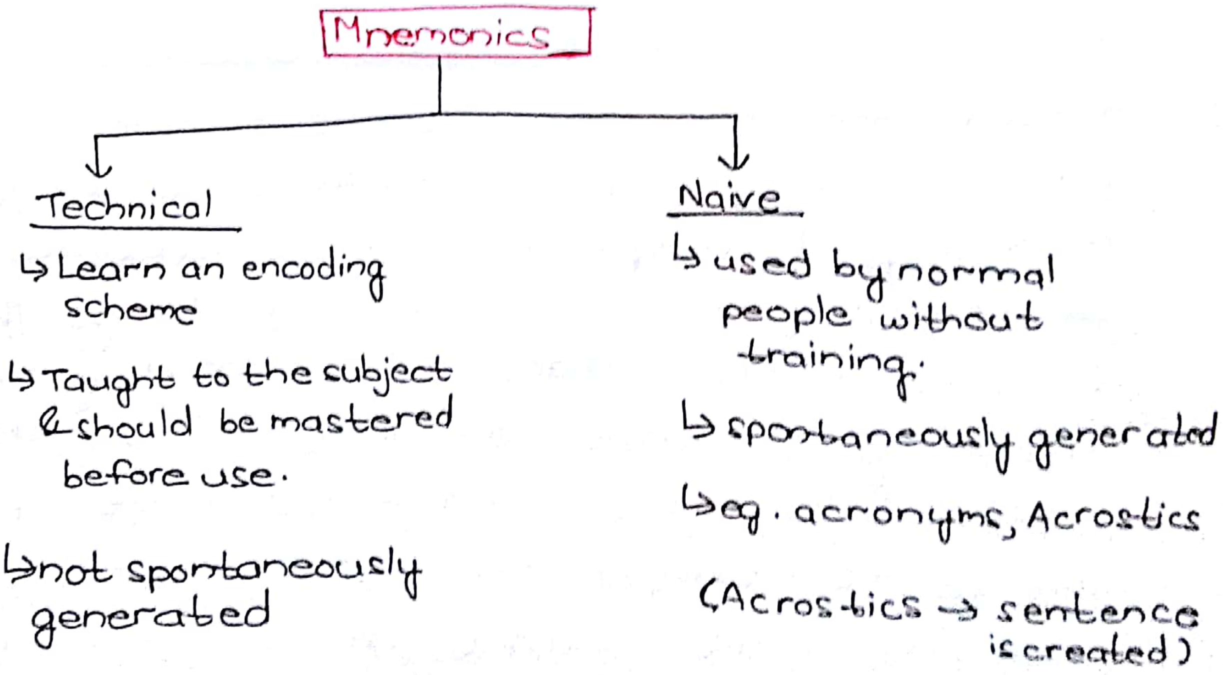


Learning Style

Visual Learners
→ written notes
→ diagrams, etc
(majority)

Auditory Learners

Kinesthetic Learners
↳ through touch & movement



Mnemonics

Technical
↳ Learn an encoding scheme
↳ Taught to the subject & should be mastered before use.
↳ not spontaneously generated

Naive
↳ used by normal people without training.
↳ spontaneously generated
↳ eg. acronyms, Acrostics
(Acrostics → sentence is created)

echnical mnemonics example

Method of Loci

↳ How location can be used to remember info.

Keyword Method

↳ effort will be made to relate new words with the keywords already present in the subject

Metamemory

* Awareness or knowledge about memory

* It is part of metacognition

* How much time where, which kind of strategy, what kind of intervals → this knowledge is metamemory.

* Metamemory is a function of → task
→ strategy
→ person

→ Flavell refers metamemory as the person's general knowledge or awareness about his or her memory processes as well as how one accesses one's own memory ability. Metamemory can also be defined as people's ability to know how likely they are able to remember something or how effective some strategy ~~sho~~ would be.

A basic memory capacity is fundamental to learn from experiences. As children get older, memory develops and they become more efficient at remembering things. They also become more aware of improving their memory and they are increasingly able to reflect on the strategies that they will use to remember info. In other words, they become more aware about their meta memory. There are 4 broad aspects of metamemory.

(i) Factual info. about memory tasks & processes
~~(ii)~~ i.e. the knowledge about how memory works & about strategic behaviour.

(ii) Memory monitoring → Awareness about how we typically use our memory as well as the awareness of the current state of our memory.

(iii) ~~&~~ Memory self efficacy

↳ The sense of how well we use our memory in demanding situations.

(iv) Memory related Affect

↳ Emotional state that may be related to or generated by memory demanding situations.

There are 2 main structural components of metamemory

(i) Declarative knowledge

(ii) Procedural knowledge

(i) Declarative knowledge

It enables the person to evaluate the content of his memory. It includes 3 distinct sub-components.

a) Knowledge of content & capacity

b) Knowledge of task

c) ~~k~~ Conditional knowledge about optimum memory performance.

(ii) Procedural Knowledge

It enables the person to monitor and regulate memory performance. It includes 2 sub-components.

(a) Control

(b) Monitoring

07-Jan-2019

Performance = Ability × Motivation
- Ability
  - → Cognitive
  - → Meta-cognitive

How to improve metamemory
- → Self ~~learni~~ observation
- → Instructions

Metamemory is assumed to play a significant role in children's memory & learning processes. It is now also thought to play an important role in the decline of cognitive performance with age.

Other reasons for ~~ill~~ under performance (other than cognitive ability) →
(i) poor meta-cognitive skills
(ii) Lack of motivation.

Q) Children from unprivileged background with same level of IQ ~~show~~ as children from privileged background will show lower performance?

Ans:- The difference is due to difference in development of metamemory skills.

Q) Discuss the relationship bet. Academic performance & Metamemory skills.

Q) Metamemory is a function of caste, neighbourhood, socio-economic conditions, etc.

eg. In unprivileged groups, parents never ask children about their activities of the day → Thus, no chance to develop memory through this exercise of recall.

Metamemory awareness is rather limited in the children uptil the age of 10. Young children find it difficult to monitor the contents of their memory and estimate the resources that they would need for adequate performance on a cognitive task. Children younger than 10 years of age have poor self-regulation and they are not able to select appropriate strategy for meeting the challenge of cognitive task & for monitoring their learning. Even in adults, metamemory is sometimes poor leading to overconfidence and illusions of knowing.

Metamemory development is incremental & continuous. Development appears to be linear in nature with steady increase in the metamemory awareness control & monitoring from pre-school years to early puberty. Research does not reveal significant breaks or jumps in metamemory ability. Thus, suggesting a continuous development over a 10 year period from early childhood to adolescence

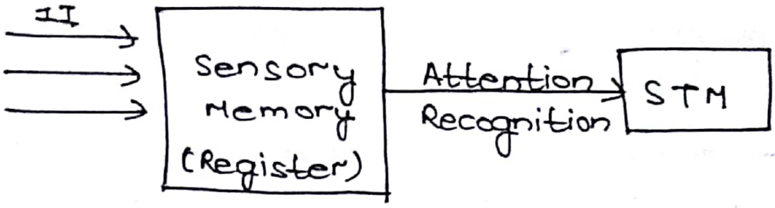
Metamemory knowledge is self constructed in nature but it must be admitted that individual & interactive problem solving as well as explicit ~~[illegible]~~ strategy instruction & monitoring training facilitates the self constructed knowledge.

Metamemory influences our learning in a big way by:

(i) Making us use limited cognitive resources effectively.
(ii) Facilitate our comprehension monitoring
(iii) Facilitate effective strategy use.

(iv) Helping us plan, sequence & monitor the learning task effectively.

* Sensory Memory


II
Sensory Memory (Register)
Attention
Recognition
STM

- Pre-attentive processes (not in ~~the~~ individual's control)

⇒ Sensory Memory → (i) Literal copy
(ii) Decay
(iii) Visual → 1 sec   Auditory → 3-4 sec
(iv) No way to maintain these memories (in the sensory register)

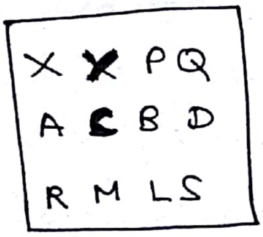
visual → iconic
auditory → echoic
tactual → haptic

⇒ 'Iconic' term coined by Neisser.

⇒ Major contribution by Sperling

(i) Whole report procedure
(ii) Partial " "

Exp
Subjects


X X P Q
A C B D
R M L S

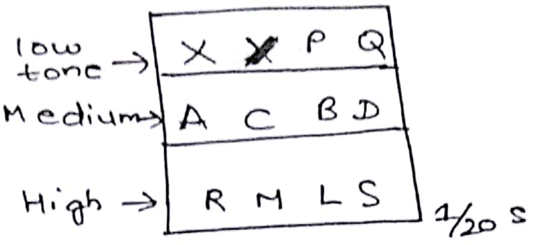
1/20 of a sec

After that subjects were asked to recall → 4 to 5 letter were recalled.

⇒ This was whole report procedure.

⇒ Subjects told that they have seen much more than what they can recall.

* Partial report procedure



Subjects were able to recall all 4 alphabets of the row corresponding to that tone.

After the display, a tone will be played and that particular row has to be recalled.

Thus, entire display was present in their memory but by the time they recalled 4, it was lost from their memory (faded).

Also, background events also play some role, dark background was better than light background for recalling.

This was Sperling's Experiment

(All the things are present in the sensory memory & we read it out → before it fades).

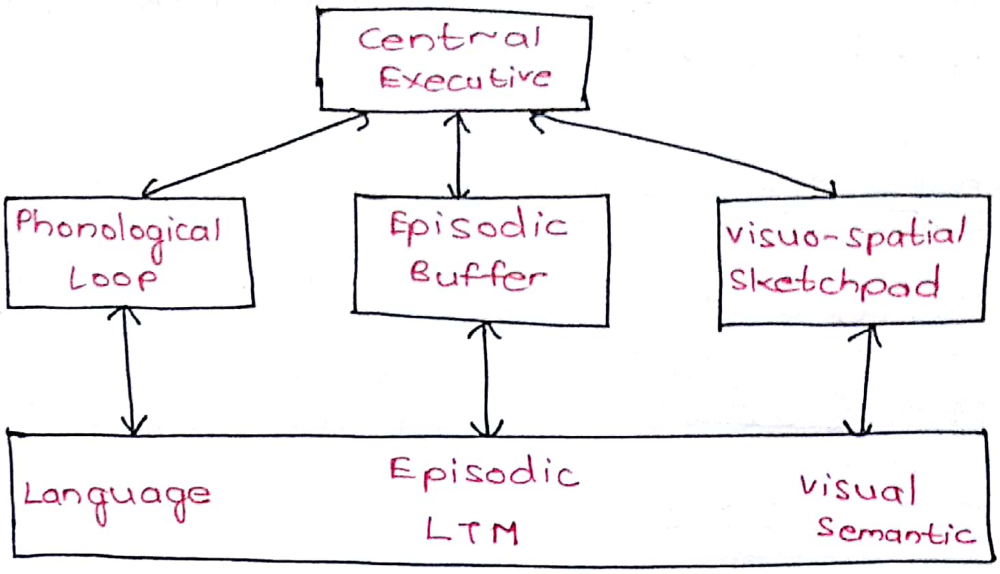
*Q) How is ~~Iconon~~ Iconic memory ~~is~~ precategorical?

Ans:- It cannot be altered, it has to be taken as a literal copy. Altercations are done (addition & subtraction) in the LTM & STM.

Working Memory

* Cognitive system that keeps tack relevant information in an active state so that it can be easily accesed, stored & evaluated

* Working memory is multicomponent in Nature.


Central Executive
Phonological Loop
Episodic Buffer
Visuo-Spatial Sketchpad
Language
Episodic LTM
Visual Semantic

→ given by Pribram, Miller & Galanter

→ Contribution done by Baddley & Hitch

Functions ⟶ a) Processing
b) Storage

⇒ This concept arrived as there were some limitations with ~~&~~ the concept of STM.

Said / Found
a) Passive ⟶ Active

b) Single component ⟶ Multi-component
(not possible to do processing & storage at the same place)

* Use of STM without LTM examples → Mental Arithmetic
↳ wit

⇒ Sometimes, info. is organised ~~by~~ in STM itself.

Q) What necessitated the arrival of Working Memory?

(i) Central Executive
↳ Attention deployment System
↳ Focusing & Switching of attention
↳ It is limited capacity system

→ It also does the work of temporary activation of LTM and is modality free component (works in all visual, auditory, etc)

→ It controls 2 slave systems ⟶ a) Phonological loop
b) Visuo- spatial sketchpad

⇒ It controls & co-ordinates the activities of its 2 slave systems.

⇒ All decision making & planning is ~~does~~ done by CE.

⇒ It has no storage capacity of its own but direct the 2 slave systems to store.

•(execute the functions)

*When, Baddley & Hitch initially gave the model, ep. buffer was not present → It was realised that even when 2 slave systems are busy, memories are sent to LTM.

* Episodic buffer can send phonological as well as visual & spatial ~~me~~ info.

* Dis-executive Syndrome → Damage to Central Executive (frontal Lobe)
eg. in Alzhiemer's disease

Damage to CE

* Perseveration Defect → when finishing a task was achieved, they again starte the task.

* Dis-executive Syndrome → conversation abilities will be affected.

* Phonological loop

(i) Phonological store → actual storage location
↓
to stores acousti or verbal info.

(ii) Articulatory control processes
↳ rehearsal device

⇒ It stores acoustic & verbal info.

⇒ Evidence of this is Skagg-Robinson's effect (Phonological Similarity effect)

⇒ Word - Length effect

↳ rehearsal is required to store in phonological store (after 2s)

↳ larger length of word → diff. to rehearse, take more time → less no. of words can be put in the store.

↳ Length effect would be applicable to phonological loop → Art. Control Processes were blocked, when done through visual sketchpad route → no word length effect.

#

* Phonetic preferrence to rehearse can stop only if it is blocked → by giving some other task.

- Visual route is not a preferrence as echoic memory is better than iconic memory.

*Empirical Evidence for visual-spatial sketchpad

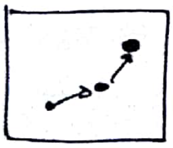
(i) ↳ Word length effect is indirect evidence

(ii) Dual - Tasks

eg. Eating food while watching TV

↳ Spatial vs visual is ~~appea~~ not a problem but 2 visual tasks are a problem.

Exp



Trace the erratically moving dot with finger

& Remember a visual task

⇒ They failed

This can be done only when one task is so much perfected that attention need not be wasted too much on it, two visual tasks can be done simultaneously

⇒ Huge MRI support for the existence of all 4 parts.